Blowdown Energy Recovery

Blowdown waste heat can be recovered with a heat exchanger, a flash tank, or flash tank in combination with a heat exchanger. Lowering the pressure in a flash tank allows a portion of the blowdown to be converted into low pressure steam. This low pressure steam is most typically used in deaerators. Drain water from the flash tank is then routed through a heat exchanger. Cooling the blowdown has the additional advantage of helping to comply with local codes limiting the discharge of high temperature liquids into the sewer system.

Adapted from an Energy TIPS fact sheet that was originally published by the Industrial Energy Extension Service of Georgia Tech. For additional information on industrial energy efficiency measures, contact the OIT Clearinghouse at (800) 862-2086.

Recover Heat from Boiler Blowdown

Heat can be recovered from boiler blowdown by using a heat exchanger to preheat boiler makeup water. Any boiler with continuous blowdown exceeding 5% of the steam rate is a good candidate for the introduction of blowdown waste heat recovery. Larger energy savings occur with high-pressure boilers. The following table shows the potential for heat recovery from boiler blowdown.

Recoverable Heat from Boiler Blowdown

Blowndown Rate, % Boiler feedwater	Heat Recovered, Million Btu per hour (MBtu/hr)				
	Boiler Operating Pressure, psig				
	50	100	150	250	300
2	0.45	0.5	0.55	0.65	0.65
4	0.9	1.0	1.1	1.3	1.3
6	1.3	1.5	1.7	1.9	2.0
8	1.7	2.0	2.2	2.6	2.7
10	2.2	2.5	2.8	3.2	3.3
20	4.4	5.0	5.6	6.4	6.6

Based on a steam production rate of 100,000 pounds per hour, 60°F makeup water, and 90% heat recovery.

Example

In a plant where the fuel cost is $3.00 / MBtu, a continuous blowdown rate of 3200 pounds per hour (lbs / hr) is maintained to avoid the buildup of high concentrations of dissolved solids. What are the annual savings if a makeup water heat exchanger is installed that recovers 90% of the blowdown energy losses? The 82% efficient boiler produces 50,000 lbs / hr of 150-psig steam. It operates for 8000 hours per year. The blowdown ratio is:

$$\text{Blowdown Ratio} = \frac{3200}{3200 + 50{,}000} = 6.0\%$$

From the table, the heat recoverable corresponding to a 6% blowdown ratio with a 150-psig boiler operating pressure is 1.67 MBtu / hr. Since the table is based on a steam production rate of 100,000 lbs / hour, the annual savings for this plant are:

$$\textbf{Annual Energy Savings} = \frac{1.67 \text{ MBtu/hr} \times (50{,}000 \text{ lbs/hr} / 100{,}000 \text{ lbs/hr}) \times 8000 \text{ hrs/yr}}{0.82} = \textbf{8146 MBtu}$$

Annual Cost Savings = 8146 MBtu / year x $3.00 / Mbtu **= $24,438**

Suggested Actions

If there is a continuous blowdown system in place, consider installing a heat recovery system. If there is a non-continuous blowdown system, then consider the option of converting it to a continuous blowdown system coupled with heat recovery.

About DOE's Office of Industrial Technologies

The Office of Industrial Technologies (OIT), through partnerships with industry, government, and non-governmental organizations, develops and delivers advanced energy efficiency, renewable energy, and pollution prevention technologies for industrial applications. OIT is part of the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy.

OIT encourages industry-wide efforts to boost resource productivity through a strategy called Industries of the Future (IOF). IOF focuses on the following nine energy and resource intensive industries:

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- ☐ Plant Services Article - *The Steam Challenge*
- ☐ Energy Manager Article - *Steaming Ahead*
- ☐ Oak Ridge National Laboratory's Insulation Guidelines
- ☐ 1998 IETC Steam Session Papers

Case Studies –

- ☐ Georgia Pacific Achieves 6-Month Payback
- ☐ Bethlehem Steel Showcase Demonstration

Software –

- ☐ 3EPlus Software for Determining Optimal Insulation Thickness

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Documents –

- ☐ Improving Compressed Air System Performance: A Sourcebook for Industry

Training –

- ☐ Fundamentals of Compressed Air Systems (For schedule and location, call (800) 862-2086)

Access the Web site at ***www.knowpressure.org***.

Industrial Assessment Centers — enable small and medium-sized manufacturers to have comprehensive industrial assessments performed at no cost to the manufacturer.

Documents –

- ☐ IAC Database

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